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Climate of the Past Discussions

Interactive comment on "Climate history of the Southern Hemisphere Westerlies belt during the last glacial-interglacial transition revealed from lake water oxygen isotope reconstruction of Laguna Potrok Aike (52° S, Argentina)" *by* J. Zhu et al.

Anonymous Referee #1

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This paper presents an oxygen isotope record from Laguna Potrok Aike in Patagonia, derived from cellulose and bulk organic matter found in the lake's sediments. The record dates back to the last glacial/interglacial transition and allows for a reconstruction of lake water delta 18O, which in turn is attributed to temperature-driven rainwater d18O variations and evaporative enrichment. Since the evaporative enrichment is to some extent a function of wind speed, it may allow for a reconstruction of past wind characteristic associated with the Southern hemisphere westerlies.

The paper is very well written and easy to read and follow along. The analyses have been performed very carefully and all interpretations, to the extent that I can judge, appear logical and justified. However, I am not a geochemist and cannot assess the adequacy of the lab analyses.

Some of the interpretations remain a bit speculative since the relatively minor enrichment in 18O since the last glacial are not easy to explain. The authors put forward several hypotheses to explain this conundrum. Ultimately, to answer this question will probably require a combination of proxy analyses and isotope-enabled climate modeling. Nonetheless this paper provides an important first step in the right direction. I only have a few small comments, listed below, and suggest accepting the paper after minor revisions have been incorporated.

Fig. 3 demonstrates that both temperature and d18O follow a seasonal cycle, but this does not prove a causal mechanism (both may simply be driven by a common forcing that also has a seasonal cycle). This lack of removal of seasonality is a common mistake in paleoclimate research. The correct analysis here would require using monthly anomalies (departures from long-term monthly mean) to verify that this relationship (which may be time-scale dependent) also holds on interannual time scales with seasonal forcing removed. Statements, such as in the first paragraph of section 5.1, that the analysis in Fig. 3 indicates an influence of long-term temperature change on d18O remain conjecture as long as they are based on raw monthly data without removal of the seasonal cycle.

Section 5.3 and Fig. 10: The ITCZ may indeed have shifted southward prior to the onset of the last deglaciation, but Botuvera is not really an adequate record to discuss this phenomenon. Botuvera does not receive precipitation from the ITCZ, but from the South American summer monsoon (summer) and the SW Atlantic (winter) months. Hence it is primarily a recorder of the waxing and waning of the summer monsoon and not the ITCZ (see discussion in original publication of Botuvera Cave; Cruz et al., Nature, 2005)

Minor edits:

Page 2447, line 11: ‘tracers’ Page 2448, line 12: ‘referencing of journal ‘Palaeo3’ is incomplete. Page 2451, lin15: ‘Arctic’

Interactive comment on Clim. Past Discuss., 10, 2417, 2014.